Meddude Edexcel Discord Server

Disclaimer: This pdf can be used or distributed for non-profit purpose. It is against owners will that you use this for profit making or any other source(s) of income.

2014 June C34 Q4

Question Number	Scheme	Marks
4. (a)	$\left\{\int (2x+3)^{12}\,dx\right\} = \dfrac{(2x+3)^{13}}{(13)(2)}\{+c\}$ $\pm\lambda(2x+3)^{13}$ $\dfrac{(2x+3)^{13}}{(13)(2)}\{+c\}$ (Ignore '+ c')	M1 A1 **[2]**
(b)	$\left\{\int \dfrac{5x}{4x^2+1}\,dt\right\} = \dfrac{5}{8}\ln(4x^2+1)\{+c\}$ or $\dfrac{5}{8}\ln(x^2+\frac{1}{4})$ $\{+k\}$	M1 A1 **[2]** **4**

Notes

(a) **M1**: Gives $\pm\lambda(2x+3)^{13}$ where λ is a constant or $\pm\mu(x+\frac{3}{2})^{13}$

A1: Coefficient does not need to be simplified so is awarded for $\dfrac{(2x+3)^{13}}{(13)(2)}$ or for $\dfrac{2^{12}}{13}(x+\frac{3}{2})^{13}$ i.e. $\dfrac{4096}{13}(x+\frac{3}{2})^{13}$

Ignore subsequent errors and condone lack of constant c

N.B. If a binomial expansion is attempted, then it needs all thirteen terms to be correctly integrated for M1A1

(b) **M1**: Gives $\pm\mu\ln(4x^2+1)$ where μ is a constant or $\pm\mu\ln(x^2+\frac{1}{4})$ or indeed $\pm\mu\ln(k(4x^2+1))$

May also be awarded for $\dfrac{5}{8}\ln(4x+1)$ or $\dfrac{5}{8}\ln(x^2+1)$, where coefficient 5/8 is correct and there is a slip writing down the bracket.

It may also be given for $\pm\mu\ln(u)$ where u is clearly defined as $(4x^2+1)$ or equivalent substitutions such as $\pm\mu\ln(4u+1)$ where $u=x^2$

A1: $\dfrac{5}{8}\ln(4x^2+1)$ or $\dfrac{5}{8}\ln(x^2+\frac{1}{4})$ o.e. The modulus sign is not needed but allow $\dfrac{5}{8}\ln|4x^2+1|$

Also allow $0.625\ln(4x^2+1)$ and condone lack of constant c

N.B. $\dfrac{5}{8}\ln 4x^2+1$ with no bracket can be awarded M1A0

2015 June C34 Q5

Question Number	Scheme	Marks
5.(i)	$\frac{dy}{dx}=\frac{(x+1)-x}{(x+1)^2}=\frac{1}{(x+1)^2}$ or $y=\frac{x}{x+1}=1-\frac{1}{x+1}\Rightarrow\frac{dy}{dx}=\frac{1}{(x+1)^2}$	M1
	(see notes for further methods)	
	$\frac{1}{(x+1)^2}=\frac{1}{4}$ *or* $(x+1)^2=4$ *or* $x^2+2x+1=4$	A1
	$x=1,-3$	M1 A1
		(4)
(ii)	$\int\frac{t+1}{t}\,dt=\int 1+\frac{1}{t}\,dt=t+\ln t\ (+c)$ see notes for integration by parts.	M1A1
	$[t+\ln t]_a^{2a}=\ln 7\Rightarrow 2a+\ln 2a-a-\ln a=\ln 7$	
	$a+\ln\left(\frac{2a}{a}\right)=\ln 7\Rightarrow a=\ln\left(\frac{7}{2}\right)$ or $a=\ln 7-\ln 2$	dM1A1
		(4)
		(8 marks)

2016 June C34 Q7

7 (a)	Strip width = 1	May be implied by their trapezium rule.	B1
	$\text{Area} \approx \frac{1}{2}\left(\frac{1}{\sqrt{9}}+\frac{1}{\sqrt{15}}+2\left(\frac{1}{\sqrt{11}}+\frac{1}{\sqrt{13}}\right)\right)$ $\approx \frac{1}{2}(0.33...+0.25...+2(0.30...+0.27...))$	M1: Correct structure for the y values. Look for (y at $x = 2$) + (y at $x = 5$) + 2(sum of other y values).	M1 A1
		A1: Correct numerical expression. If decimals are used, look for awrt 1dp initially, however a correct final answer would imply this mark.	
	Awrt 0.875		A1
			(4)
	May use separate trapezia:		
	$\text{Area} \approx \frac{1}{2}\left(\frac{1}{\sqrt{9}}+\frac{1}{\sqrt{11}}\right)+\frac{1}{2}\left(\frac{1}{\sqrt{11}}+\frac{1}{\sqrt{13}}\right)+\frac{1}{2}\left(\frac{1}{\sqrt{11}}+\frac{1}{\sqrt{15}}\right)$		
	B1: Strip width = 1 M1: Correct structure for the y values as above A1: Correct expression as described above A1: Awrt 0.875		
(b)	$\int \frac{1}{\sqrt{2x+5}}dx = (2x+5)^{\frac{1}{2}}$	M1: $\int \frac{1}{\sqrt{2x+5}}dx = k(2x+5)^{\frac{1}{2}}$	M1A1
		A1: $\int \frac{1}{\sqrt{2x+5}}dx = (2x+5)^{\frac{1}{2}}$	
	$\int_2^5 \frac{1}{\sqrt{2x+5}}dx = (2(5)+5)^{\frac{1}{2}} - (2(2)+5)^{\frac{1}{2}}$	Substitutes 5 and 2 and subtracts the right way round. May be implied by the correct exact answer but not by a decimal answer **only** e.g. 0.8729… and not by work in decimals e.g. 3.872… −3 unless the substitution of 5 and 2 is explicitly seen.	dM1
	$= \sqrt{15} - \sqrt{9}\,(= \sqrt{15} - 3)$	$\sqrt{15} - \sqrt{9}$ or $\sqrt{15} - 3$	A1
			(4)

2017 October C34 Q5

Question Number	Scheme	Marks
5(i)	$\int\left(\left(3x+5\right)^9+\mathrm{e}^{5x}\right)\mathrm{d}x=\frac{\left(3x+5\right)^{10}}{30},+\frac{\mathrm{e}^{5x}}{5}\left(+c\right)$	M1A1, B1
		(3)
(ii)	$\int\frac{x}{x^2+5}\mathrm{d}x=\frac{1}{2}\ln\left(x^2+5\right)$	M1A1
	$\int_2^b\frac{x}{x^2+5}\mathrm{d}x=\ln\left(\sqrt{6}\right)=\frac{1}{2}\ln\left\lvert b^2+5\right\rvert-\frac{1}{2}\ln\left\lvert 2^2+5\right\rvert=\ln\left(\sqrt{6}\right)$	M1
	$\Rightarrow\ln\left(\frac{b^2+5}{9}\right)=\ln 6\Rightarrow b=7$	**dd**M1, A1
		(5)
		(8 marks)

2020 January P3 Q8

Question Number	Scheme	Marks
8.(i)	$\int \frac{2}{3x-1}\,\mathrm{d}x = \frac{2}{3}\ln(3x-1)$	M1 A1
	$\int_3^{42} \frac{2}{3x-1}\,\mathrm{d}x = \frac{2}{3}\ln(125) - \frac{2}{3}\ln(8) = \ln\frac{25}{4}$	dM1 A1
		(4)
(ii)	$\frac{2x^3-7x^2+8x+1}{(x-1)^2} = 2x+B+\frac{C}{(x-1)^2}$	B1
	Full method to find values of A, B and C	M1
	$\frac{2x^3-7x^2+8x+1}{(x-1)^2} = 2x-3+\frac{4}{(x-1)^2}$	A1
	$\int \mathrm{h}(x)\,\mathrm{d}x = \int Ax+B+\frac{C}{(x-1)^2}\,\mathrm{d}x$	
	$= \frac{1}{2}Ax^2+Bx-\frac{C}{(x-1)}$	M1 A1 ft
	$= x^2-3x-\frac{4}{(x-1)} \quad (+c)$	A1
		(6)
		10 marks

2020 October P3 Q5

5 (a)	$\sin 3x \equiv \sin(2x+x) \equiv \sin 2x\cos x + \cos 2x \sin x$	M1
	$\equiv 2\sin x\cos x\cos x + \left(1-2\sin^2 x\right)\sin x$	M1
	$\equiv 2\sin x\left(1-\sin^2 x\right)+\left(1-2\sin^2 x\right)\sin x$	ddM1
	$\equiv 3\sin x - 4\sin^3 x \quad *$	A1*
		(4)
(b)	$\int_0^{\frac{\pi}{3}} \sin^3 x \, dx = \int_0^{\frac{\pi}{3}} \frac{3}{4}\sin x - \frac{1}{4}\sin 3x \, dx$	M1
	$= \left[-\frac{3}{4}\cos x + \frac{1}{12}\cos 3x\right]_0^{\frac{\pi}{3}}$	dM1 A1
	$= \frac{5}{24}$	A1
		(4)
		(8 marks)

2020 October P3 Q9

9 (a)	$$\begin{array}{r} x^2+2 \\ x^2-x-12\overline{)x^4-x^3-10x^2+3x-9} \\ \underline{x^4-x^3-12x^2} \\ 2x^2+3x-9 \\ \underline{2x^2-2x-24} \\ 5x+15 \end{array}$$	M1A1
	$\dfrac{x^4-x^3-10x^2+3x-9}{x^2+x-12} \equiv x^2+2+\dfrac{5(x+3)}{(x-4)(x+3)}$	M1
	$\equiv x^2+2+\dfrac{5}{(x-4)}$ or stating $P=2, Q=5$	A1
		(4)
(b)	$g'(x)=2x-\dfrac{5}{(x-4)^2}$	M1A1
	Subs $x=2$ into $g'(2)=2\times 2-\dfrac{5}{(2-4)^2}=\dfrac{11}{4}$	M1
	Uses $m=g'(2)=\left(\dfrac{11}{4}\right)$ with $(2, g(2))=\left(2,\dfrac{7}{2}\right)$ to form equation of tangent	
	$y-\dfrac{7}{2}=\dfrac{11}{4}(x-2) \Rightarrow y=\dfrac{11}{4}x-2$	dM1A1
		(5)
(c)	$\int x^2+2+\dfrac{5}{(x-4)}\,dx=\dfrac{1}{3}x^3+2x,+5\ln\lvert x-4\rvert$	M1 A1ft
	Area $R=\left[\dfrac{1}{3}x^3+2x+5\ln\lvert x-4\rvert\right]_0^2=\left(\dfrac{8}{3}+4+5\ln 2\right)-(0+0+5\ln 4)$	dM1
	$=\dfrac{20}{3}+5\ln 2-5\ln 4=\dfrac{20}{3}-5\ln 2$	ddM1 A1
		(5)
		(14 marks)

2021 January P3 Q1

Question Number	Scheme	Marks
1	$\int \frac{x^2-5}{2x^3}\,\mathrm{d}x = \int Ax^{-1} - Bx^{-3}\,\mathrm{d}x = C\ln x + Dx^{-2}\,(+c)$	M1 dM1
	$= \frac{1}{2}\ln x + \frac{5}{4}x^{-2} + c$	A1
		(3)
		Total 3

2021 January P3 Q9

Question Number	Scheme	Marks
9(i)	$\int \frac{3x-2}{3x^2-4x+5}\,dx = \frac{1}{2}\ln\left(3x^2-4x+5\right)(+c)$	M1, A1
		(2)
(ii)	$\int \frac{e^{2x}}{\left(e^{2x}-1\right)^3}\,dx = -\frac{1}{4}\left(e^{2x}-1\right)^{-2}(+c)$	M1, A1
		(2)
		Total 4

2021 June P3 Q3

3(i)	$\int \frac{12}{(2x-1)^2}\,dx = \frac{-6}{(2x-1)}(+c)$	M1 A1
		(2)
(ii)(a)	(a) $\frac{4x+3}{x+2} = 4 - \frac{5}{x+2}$	M1, A1
		(2)
(ii)(b)	(b) $\int \frac{4x+3}{x+2}\,dx = \int 4 - \frac{5}{x+2}\,dx = 4x - 5\ln\lvert x+2\rvert\ (+c)$	M1 A1ft
	Hence $\int_{-8}^{-5} \frac{4x+3}{x+2}\,dx = (-20 - 5\ln 3) - (-32 - 5\ln 6)$	dM1
	$= 12 + 5\ln 2$	A1
		(4)
		(8 marks)

2021 October P3 Q5

5 (i)	$\int \frac{8}{(2x-3)^3}\,dx = \frac{-2}{(2x-3)^2}(+c)$	M1 A1
	$\int_2^4 \frac{8}{(2x-3)^3}\,dx = \left[\frac{-2}{(2x-3)^2}\right]_2^4 = -\frac{2}{25}+2 = \frac{48}{25}$	dM1 A1
		(4)
(ii)	$\int x\left(x^2+3\right)^7\,dx = \frac{1}{16}\left(x^2+3\right)^8 + c$	M1 A1
		(2)
		(6 marks)

2021 October P3 Q10

10.(a)	$(1+2\cos 2x)^2 = 1+4\cos 2x+4\cos^2 2x$	
	Uses $\cos 4x = 2\cos^2 2x - 1 \Rightarrow (1+2\cos 2x)^2 = 1+4\cos 2x+2\cos 4x+2$	M1
	$= 3+4\cos 2x+2\cos 4x$	A1
		(2)
(b)	$a = \frac{2\pi}{3}$	B1
	$\int 3+4\cos 2x+2\cos 4x\,dx = 3x+2\sin 2x+\frac{1}{2}\sin 4x$	M1 A1 ft
	Area $= \left[3x+2\sin 2x+\frac{1}{2}\sin 4x\right]_0^{\frac{2\pi}{3}} = 2\pi - \frac{3}{4}\sqrt{3}$	dM1 A1
		(5)
		(7 marks)

2022 January P3 Q3

3 (i)	$\int (2x-5)^7 \, dx = \frac{(2x-5)^8}{16} + c$	M1 A1 **(2)**
(ii)	$\int \frac{4\sin x}{1+2\cos x} \, dx = -2\ln(1+2\cos x) \quad (+c)$	M1 A1
	$\int_0^{\frac{\pi}{3}} \frac{4\sin x}{1+2\cos x} \, dx = \left[-2\ln(1+2\cos x)\right]_0^{\frac{\pi}{3}} = -2\ln 2 + 2\ln 3 = \ln\frac{9}{4}$	dM1 A1 **(4)** **(6 marks)**

2022 June P3 Q3

3(a)	$\int \frac{9x}{3x^2+k}\,\mathrm{d}x = \frac{3}{2}\ln\left(3x^2+k\right)+C$	M1A1
		(2)
(b)	$\frac{3}{2}\ln(75+k)-\frac{3}{2}\ln(12+k)=\ln 8$	M1
	$\frac{3}{2}\ln\left(\frac{75+k}{12+k}\right)=\ln 8$ oe	dM1
	$\frac{75+k}{12+k}=4 \Rightarrow k=\ldots$	ddM1
	$(k=)\ 9$	A1
		(4)

2022 October P3 Q1

1(a)	$2x^3-4x-15=(Ax+B)(x^2+3x+4)+C(2x+3)\Rightarrow A=\ldots$ or $x^2+3x+4\overline{)2x^3+0x-4x-15}$ with $2x\ldots$ above and $2x^3+\ldots$ below	**M1**
	$A=2$	**A1**
	$B=-6, C=3$	**A1A1**
		(4)
(b)	$\int \mathrm{f}(x)\,\mathrm{d}x=\text{"}A\text{"}\frac{x^2}{2}+\text{"}B\text{"}x+\text{"}C\text{"}\ln\left(x^2+3x+4\right)$	**M1** **A1ft**
	$\int \mathrm{f}(x)\,\mathrm{d}x=x^2-6x+3\ln\left(x^2+3x+4\right)$	
	$\int_3^5 \mathrm{f}(x)\,\mathrm{d}x=\left(5^2-6\times5+3\ln\left(5^2+3\times5+4\right)\right)-\left(3^2-6\times3+3\ln\left(3^2+3\times3+4\right)\right)=..$	**dM1**
	$=-5+3\ln 44+9-3\ln 22=4+3\ln\left(\frac{44}{22}\right)$	**M1**
	$=4+\ln 8$	**A1**
		(5)

2023 January P3 Q4

4(a)	Any correct constant, so for $A=2$ or $B=3$ or $C=-1$ or $D=5$	B1
	$2x^4+15x^3+35x^2+21x-4=Ax^2(x+3)^2+Bx(x+3)^2+C(x+3)^2+D$ $\Rightarrow A=...,B=...,C=...,D=...$ or $2x^4+15x^3+35x^2+21x-4\div(x^2+6x+9)=...x^2+...x+...+\frac{...}{(x+3)^2}$	M1
	2 correct of $A=2,B=3,C=-1,D=5$	A1
	$A=2,B=3,C=-1,D=5$	A1
		(4)
(b)	$\int f(x)\,dx=\int\left(2x^2+3x-1+\frac{5}{(x+3)^2}\right)dx=\frac{2x^3}{3}+\frac{3x^2}{2}-x-\frac{5}{x+3}(+c)$	M1A1ftA1
		(3)
		Total 7

2023 January P3 Q8

Question Number	Scheme	Notes
8	$\int (2\cos x - \sin x)^2 \, dx = \int 5\cos^2(x + 0.464) \, dx$	M1
	$= \int \frac{5\{\cos(2x + 0.927) + 1\}}{2} dx$	M1
	$\frac{5\sin(2x + 0.927)}{4} + \frac{5}{2}x$	M1
	$\frac{3\sin 2x}{4} + \cos 2x + \frac{5}{2}x + c$	A1A1
		(5)
		Total 5

2023 June P3 Q3

3 (i)	$\frac{\mathrm{d}}{\mathrm{d}x}\ln\left(\sin^2 3x\right) = \frac{1}{\sin \not{3x}} \times 2\cancel{\sin 3x} \times 3\cos 3x = 6\cot 3x$	M1 A1 **(2)**
(ii) (a)	$\frac{\mathrm{d}}{\mathrm{d}x}\left(3x^2-4\right)^6 = 36x\left(3x^2-4\right)^5$	M1 A1 **(2)**
(b)	$\int x\left(3x^2-4\right)^5 \mathrm{d}x = \frac{1}{36}\left(3x^2-4\right)^6$	B1ft
	$\int_0^{\sqrt{2}} x\left(3x^2-4\right)^5 \mathrm{d}x = \left[\frac{1}{36}\left(3x^2-4\right)^6\right]_0^{\sqrt{2}} = \frac{1}{36}(2)^6 - \frac{1}{36}(-4)^6 = -112$	M1 A1cso **(3)** **(7 marks)**

2023 October P3 Q3

3(a)	$(\cos 2A \equiv)\cos A\cos A - \sin A\sin A \equiv \cos^2 A - (1-\cos^2 A)$	M1
	$\Rightarrow \cos 2A \equiv 2\cos^2 A - 1$ *	A1*
		(2)
(b)	$\int (3-2\cos 6x)\,\mathrm{d}x = 3x - \frac{\sin 6x}{3}$ $(+c)$	M1A1
	$\left[3x - \frac{\sin 6x}{3}\right]_{\frac{\pi}{12}}^{\frac{\pi}{8}} = \left(3\left(\frac{\pi}{8}\right) - \frac{\sin\left(6\times\frac{\pi}{8}\right)}{3}\right) - \left(3\left(\frac{\pi}{12}\right) - \frac{\sin\left(6\times\frac{\pi}{12}\right)}{3}\right) = \frac{1}{8}\pi + \frac{2-\sqrt{2}}{6}$	dM1A1
		(4)
		(6 marks)